Abstract Submitted
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CO-AXL: Enhancing the injectability of high concentration drug formulations using co-axial lubrication[1] VISHNU JAYAPRAKASH, MAXIME COSTALONGA, SOMAYAJULU DHULIPALA, KRIPA K. VARANASI, Massachusetts Institute of Technology — Subcutaneous injection of concentrated drug formulations via commercial syringes is currently limited by the high viscosity of such formulations. Current approaches to solve this problem face challenges such as high cost and manufacturing complexity. In this work, we present CO-AXL – a double-barreled syringe that dramatically enhances the range of manually injectable viscosities compared to conventional syringes without a significant increase in price. The CO-AXL syringe utilizes a core annular flow, where the convection of the highly viscous formulation is facilitated by co-axial lubrication by a less viscous fluid, to reduce the hydrodynamic resistance of fluid flow in the needle. A phase diagram to achieve optimal lubrication is established, and the role of buoyancy based eccentricity in regulating the nominal pressure reduction is also examined. Up to a 7x reduction in injection force is experimentally achieved, demonstrating the promise of the technique to enhance the injectability of high concentration formulations and to create a pathway toward better patient health and lower treatment costs.

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